(12) UK Patent Application (19) GB (11) 2 368 483 (13) A

(43) Date of A Publication 01.05.2002

(21) Application No 0026045.5

(22) Date of Filing 24.10.2000

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(51) INT CL[7]
H04M 1/02 // G06F 1/16

(52) UK CL (Edition T)
H4J JK J36Q

(56) Documents Cited

GB 2355360 A	GB 2348337 A
GB 2344905 A	GB 2330982 A
GB 2299302 A	EP 0665508 A2
WO 98/06176 A1	US 5610971 A

(58) Field of Search
UK CL (Edition S) H4J JK
INT CL[7] G06F 1/16 , H04B 1/38 , H04M 1/02 1/23
Online: WPI,EPODOC,JAPIO

(54) Abstract Title
Hand-held electronic device with user interface on rear of housing

(57) A hand-held electronic device, for example a mobile telephone or personal data assistant, having a front face 2 including a display 5, a rear face 3 and a user interface 25 to input a character and/or control the functions of the device. The user interface 25 is a touch sensitive pad which, in an operative position is located on the rear face 3 of the device remote from the display 5. Alternatively the user interface 25 is provided on the inner surface 33 of a flip cover 34 which covers the front of the device when not in use. When the device is in operation, the flip cover 33 is pivoted so that its outer surface rests against the rear face of the device. The touch pad comprises a pair of capacitive sensing plates configured such that their mutual capacitance is modified in response to the presence of a user's finger.

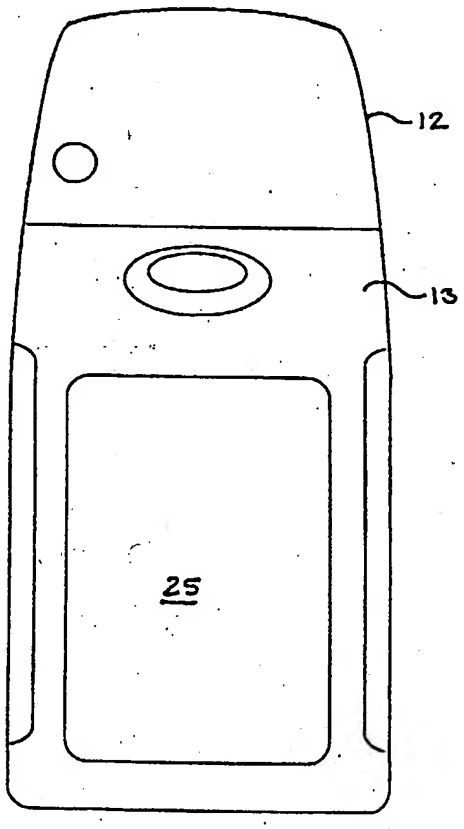

FIGURE 2

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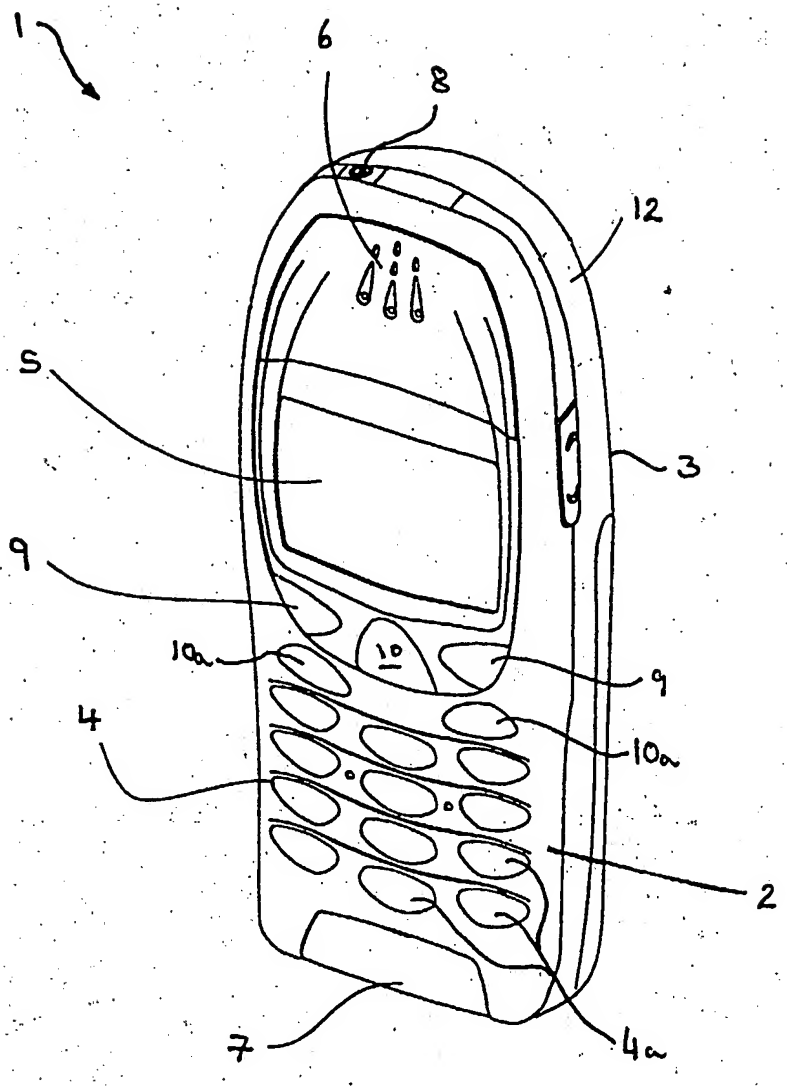

FIGURE 1

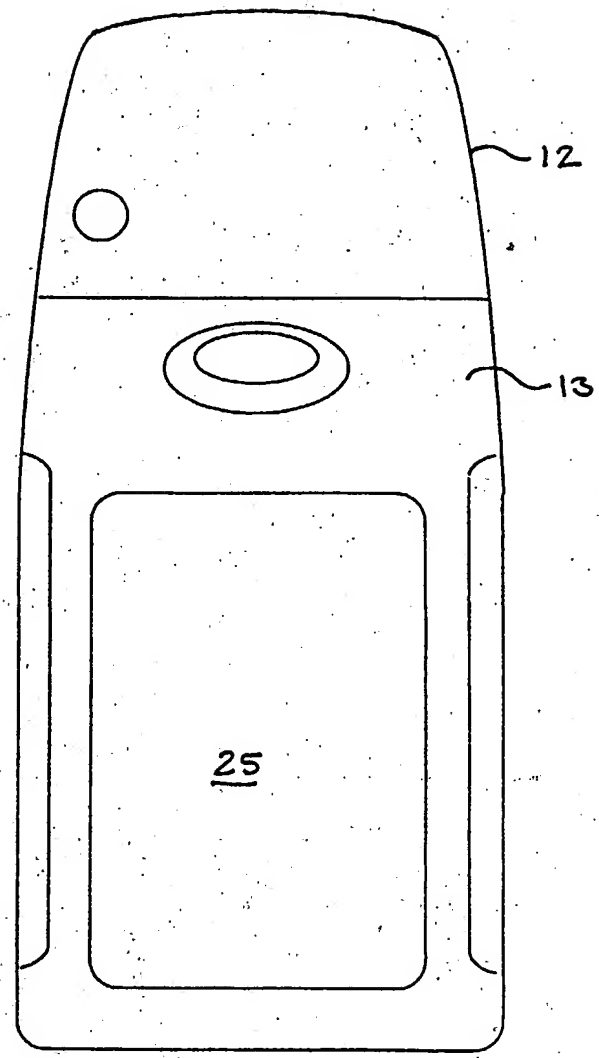

FIGURE 2

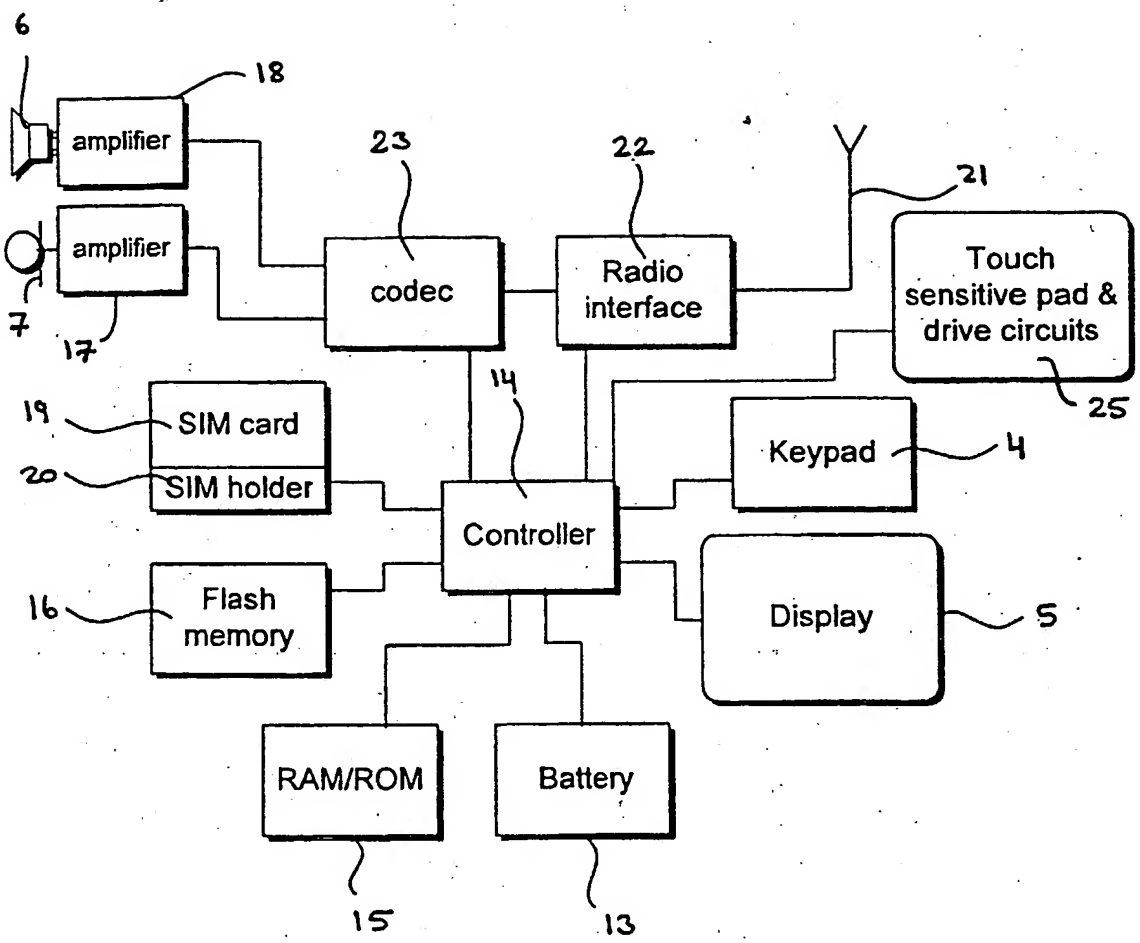
6
18
amplifier
23
22
21
amplifier
codec
Radio interface
Touch sensitive pad & drive circuits
7
17
25
19
SIM card
14
Keypad
4
20
SIM holder
Controller
16
Flash memory
Display
5
RAM/ROM
Battery
15
13

FIGURE 3.

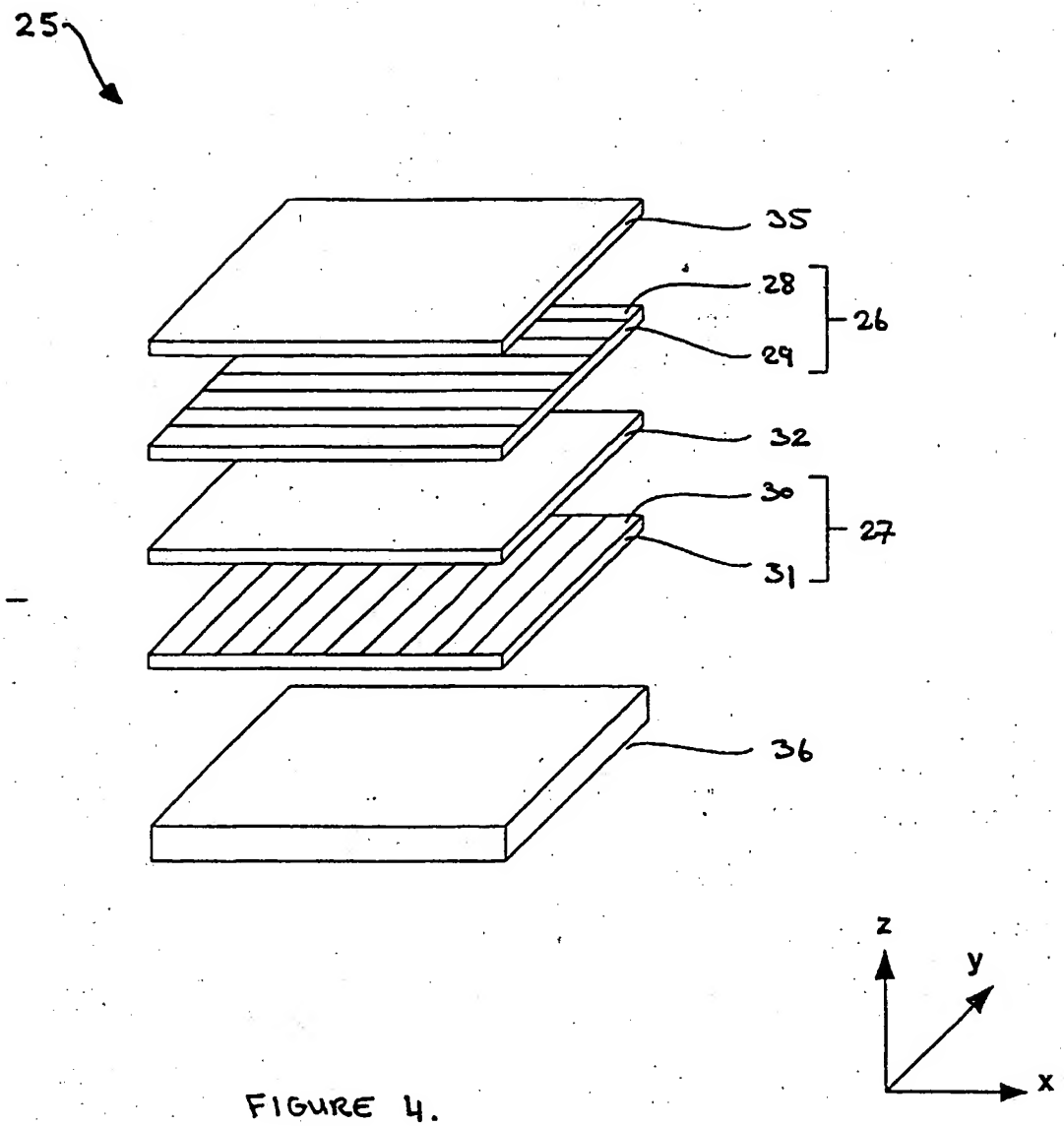

FIGURE 4.

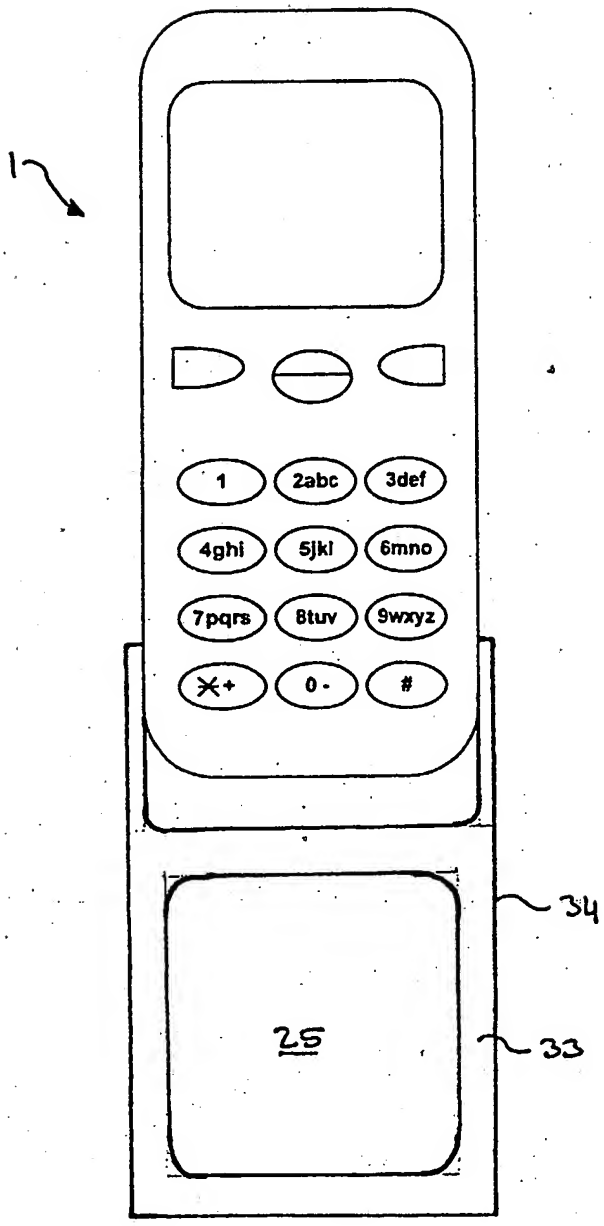

FIGURE 5

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Electronic Device

The present invention relates to a portable hand-held electronic device. In particular, the electronic device to which this invention relates is a mobile telecommunications device such as a telephone but it could also be any other type of electronic device including, for example, a personal data assistant (PDA).

A conventional mobile telephone includes a keypad having first group of alphanumeric keys by means of which a user can enter a telephone number, write a text message (SMS), write a name associated with a telephone number and input other information into the telephone. Each key is generally provided with a figure "0-9" or a sign "#" or "*" often used in text editing. In alpha mode, each key is associated with a number of letters and special signs to enable text input.

It has become desirable to improve the speed at which the functions of a mobile telephone can be activated and in which information, especially text, can be input. In a conventional mobile telephone, the input of text is a slow process as each key on the keypad represents several different characters and so multiple presses of the same key is necessary to scroll through each character associated with that particular key until the required character is located so that it can then be selected.

There is a new generation of mobile telephones that can be used to access the internet such as WAP (wireless application protocol) telephones. WAP is an industry specification agreed by most of the major telephone manufacturers and service providers that allows a WAP enabled mobile telephone, pager or personal data assistant to access the internet, effectively turning such devices into web browsers. The problems mentioned above are exacerbated with telephones of this type as larger quantities of information needs to be input into such devices to, for example, conduct a search using a search engine, enter passwords to access a subscriber based web site, view a particular URL address or play a game, so it is presently slow and tiring to enter information using the conventional technique.

One known way of overcoming the inflexibility of a conventional keypad is simply to reduce the size of each button so that a larger number of them can be incorporated into the telephone thereby reducing the number of functions that each button performs or the number of characters that must be entered using a single button. However, this makes the buttons harder to operate, increases the number of input errors and spoils the appearance of the device.

The present invention seeks to improve the ease by which the functions of a mobile electronic device, such as a telephone, can be controlled and aims to simplify how information such as text and other characters are input.

According to the invention, there is provided a hand-held electronic device having a front face including a display, a rear face and a user interface to input a character and/or control the functions of the device, wherein the user interface is a touch sensitive pad which, in an operative position, is located on the rear face of the device remote from the display.

In one preferred embodiment, the touch sensitive pad and the display are oriented in a back-to-back relationship, when the pad is in its operative position.

Conveniently, the touch sensitive pad is configured so as to be operable by means of the fingers of the hand in which the device is held.

Preferably the device includes a casing and the touch sensitive pad is embedded in a portion of the casing.

In one preferred embodiment, the electronic device includes a cover which in a closed orientation is disposed over the front face of the device and is pivotally mounted to the casing such that it is positionable in an open orientation in which it is disposed against the rear face of the device. In this case, the touch sensitive pad is conveniently formed on the cover.

Preferably, the touch sensitive pad comprises first and second capacitive sensing plates including first and second electrodes respectively.

Preferably, the electrodes are configured to have a mutual capacitance such that the mutual capacitance is modified in response to the presence of a user's finger.

In a preferred embodiment, the electronic device is a mobile telecommunication device.

The present invention also provides a method of operating the electronic device according to the invention, comprising the step of inputting a character and/or controlling the functions of the device by touching the touch sensitive pad on the rear face of the device.

The method preferably includes the step of stroking the touch sensitive pad in a particular direction to perform a pre-programmed function or to input a character.

Additionally, the method preferably includes the step of stroking the touch sensitive pad in one of a number of other directions to perform a different function or input a different character.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is an illustration showing a front perspective view of a mobile telephone according to the invention;

Figure 2 is a rear view of the mobile telephone shown in Figure 1;

Figure 3 is schematic illustration of the main components of the mobile telephone shown in Figure 1 and 2 for connection to a cellular or cordless network;

Figure 4 is an exploded perspective view of the touch sensitive pad incorporated in the telephone illustrated in Figures 1 and 2; and

Figure 5 is an alternative telephone incorporating the touch sensitive pad shown in Figure 4.

The general components and operation of a mobile telephone 1 will now be described with reference to Figures 1 to 3. The telephone 1 has a front face 2 and rear face 3 and comprises a user interface having a keypad 4, a display 5, an ear piece 6, a microphone 7 and an on/off key 8. The telephone 1 is adapted for communication via a wireless telecommunications network, e.g. a cellular network. However, the telephone 1 could also have been designed for a cordless network. The keypad 4 has a first group of keys which are alphanumeric and by means of which a user can enter a telephone number, write a text message (SMS) or write a name associated with a particular number, etc.

The keypad 4 additionally includes two soft keys 9, the functionality of which depends on the state of the telephone and the navigation in the menu by means of a navigation key 10, and two call handling keys 10a which can be used for establishing a call or a conference call, terminating a call or rejecting an incoming call.

A rear view of the telephone shown in Figure 1 is illustrated in Figure 2. The telephone includes a front casing 11 and a rear casing 12 partially formed from a removable battery pack 13. The telephone has an internal antenna (not shown). A touch sensitive pad 25 for controlling the functions of the telephone 1 and/or for inputting characters to appear on the display 5 is also provided on the rear face 3 of the telephone and is incorporated into the rear of the battery pack 13. It could however be positioned on the rear casing away 12 from the battery pack 13. The function and operation of the touch sensitive pad 25 will be described in more detail hereafter.

Figure 3 illustrates the main parts of the telephone 1 which is adapted for use in connection with a GSM network or any other telephone network. The telephone 1 may also be configured to meet the wireless application protocol specification (WAP). Signal processing is carried out under the control of a digital micro-controller 14 which has an associated RAM/ROM 15 and a flash memory 16. Electric analogue audio signals are produced by microphone 7 and amplified by pre-amplifier 17. Similarly, analogue audio signals are fed to ear piece 6 through amplifier 18. The micro-controller 14 receives instruction signals from the keypad 4

including the soft keys 9 and navigation key 10 and controls the operation of the display 5. The touch sensitive pad 25 and associated drive circuits are also shown in the schematic diagram of Figure 3.

Information concerning the identity of a user is held on a smart card 19 in the form of a GSM SIM card. The SIM card 16 is removably received in a SIM card holder 20. Radio signals are transmitted and received by means of an antenna 21 connected through an rf stage 22 to a codec 23 configured to process signals under the control of the micro-controller 14. Thus, in use, for speech, the codec 23 receives analogue signals from microphone amplifier 17, digitises them into a form suitable for transmission and feeds them to the rf stage 22 for transmission through antenna element 21 to the public land mobile network (PLMN). Similarly, received signals are fed through the antenna element 21 to be demodulated by the rf stage 22 and fed to codec 23 so as to produce analogue signals fed to amplifier 18 and ear piece 6. The device is driven by the removable battery pack 13.

The construction and operation of the touch sensitive pad 25 will now be described in more detail with reference to Figure 4. It includes first and second capacitive sensing plates 26, 27. The first sensing plate 26 comprises a first set of electrodes 28 mounted on a substrate 29. Similarly, the second capacitive sensing plate 27 comprises a second set of electrodes 30 mounted on a second substrate 31. The first and second set of electrodes 28,30 run in orthogonal directions. For example, the first set of electrodes 28 are arranged to run parallel to the x-axis (see Figure 4), while the second set of electrodes 30 are arranged to run parallel to the y-axis. The first and second sensing plates 26, 27 are bonded together by means of a first adhesive layer 32. The electrodes 28,30 may be formed from striped indium-tin-oxide (ITO) and the substrates may be formed from polyethylene terephthalate. When operational, the first electrodes 28 are scanned successively with a sensing voltage, e.g. 5 volts, and the corresponding voltage is capacitively induced on the second electrodes 30 and detected by the electronic drive circuitry associated with the touch sensitive pad 25. The touch sensitive pad 25 has a top cover layer 35 and a base 36 to which the top cover layer and the first and second sensing plates 26,27 are mounted.